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Eldering

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(54) **ADVERTISEMENT SELECTION SYSTEM
SUPPORTING DISCRETIONARY TARGET
MARKET CHARACTERISTICS**

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(51) **Int. Cl.**⁷ **G06F 17/30**
(52) **U.S. Cl.** **707/10; 707/4; 707/10; 705/10; 705/36**
(58) **Field of Search** **705/10, 14, 4, 705/26, 36; 709/206; 707/4, 10, 100**

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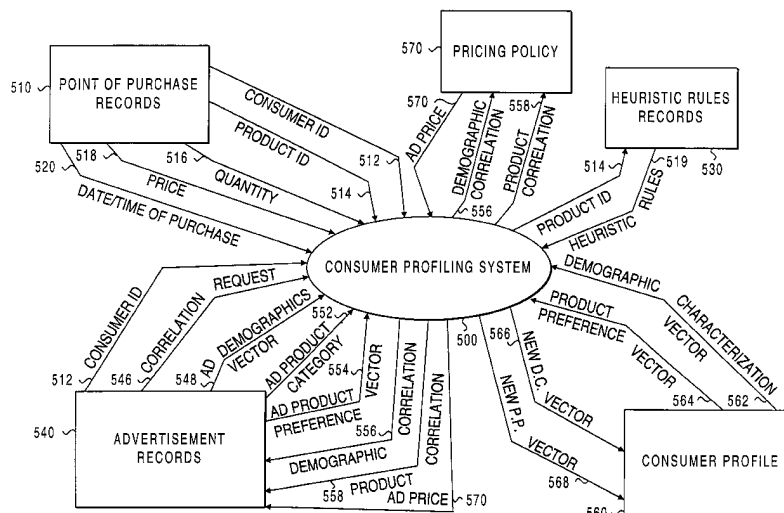
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(57) **ABSTRACT**

An advertisement selection system is presented in which vectors describing an actual or hypothetical market for a product or desired viewing audience can be determined. An ad characterization vector is transmitted along with a consumer ID. The consumer ID is used to retrieve a consumer characterization vector which is correlated with the ad characterization vector to determine the suitability of the advertisement to the consumer. The consumer characterization vector describes statistical information regarding the demographics and product purchase preferences of a consumer, and is developed from previous purchases or viewing habits. A price for displaying the advertisement can be determined based on the results of the correlation of the ad characterization vector with the consumer characterization vector. The system can be used to both increase the effectiveness and cost efficiency of advertisements, as well as for determining the price for transmitting or viewing an advertisement, based on the correlation of the ad with the consumer profile.

31 Claims, 17 Drawing Sheets



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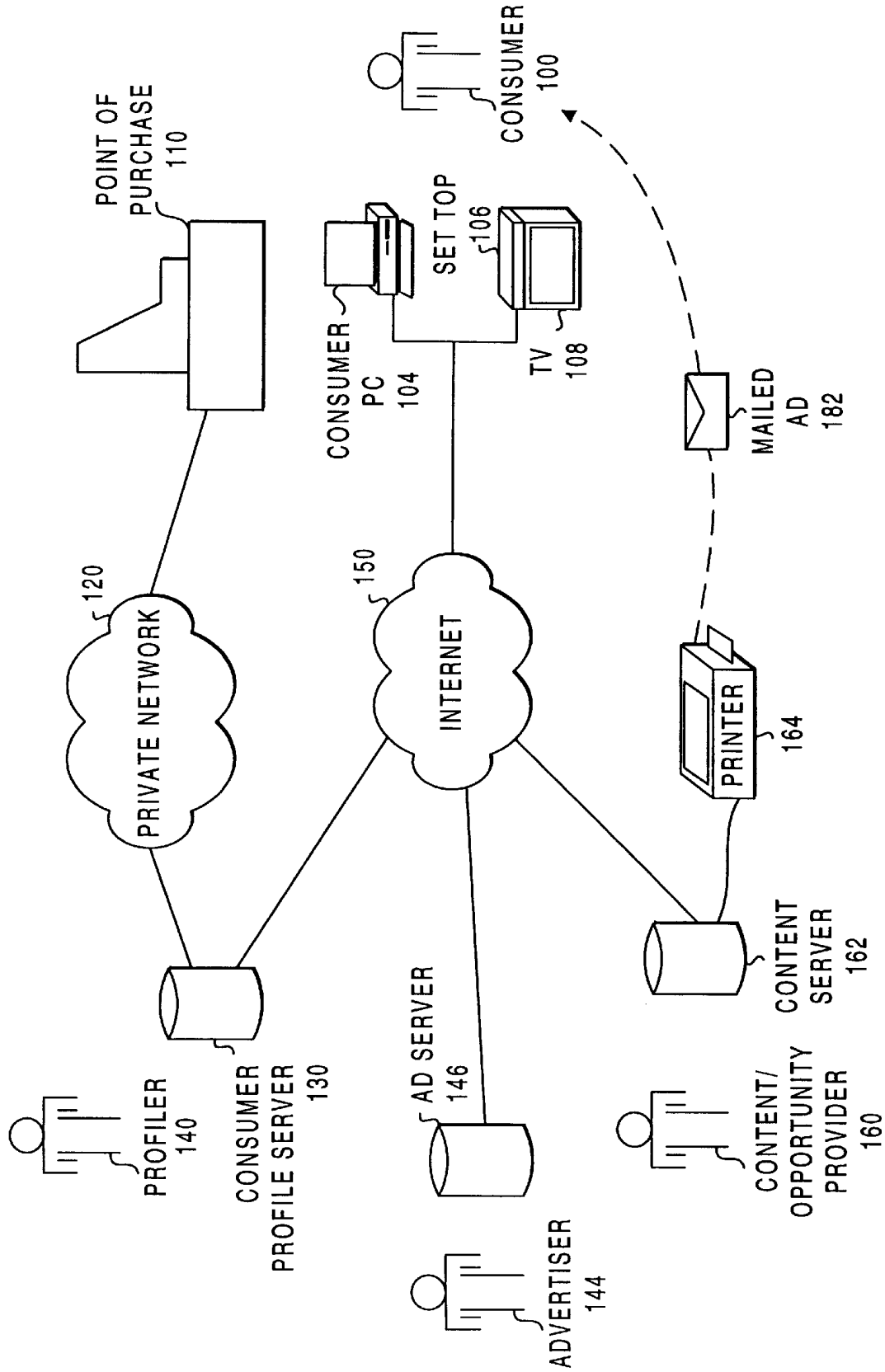


FIG. 1A

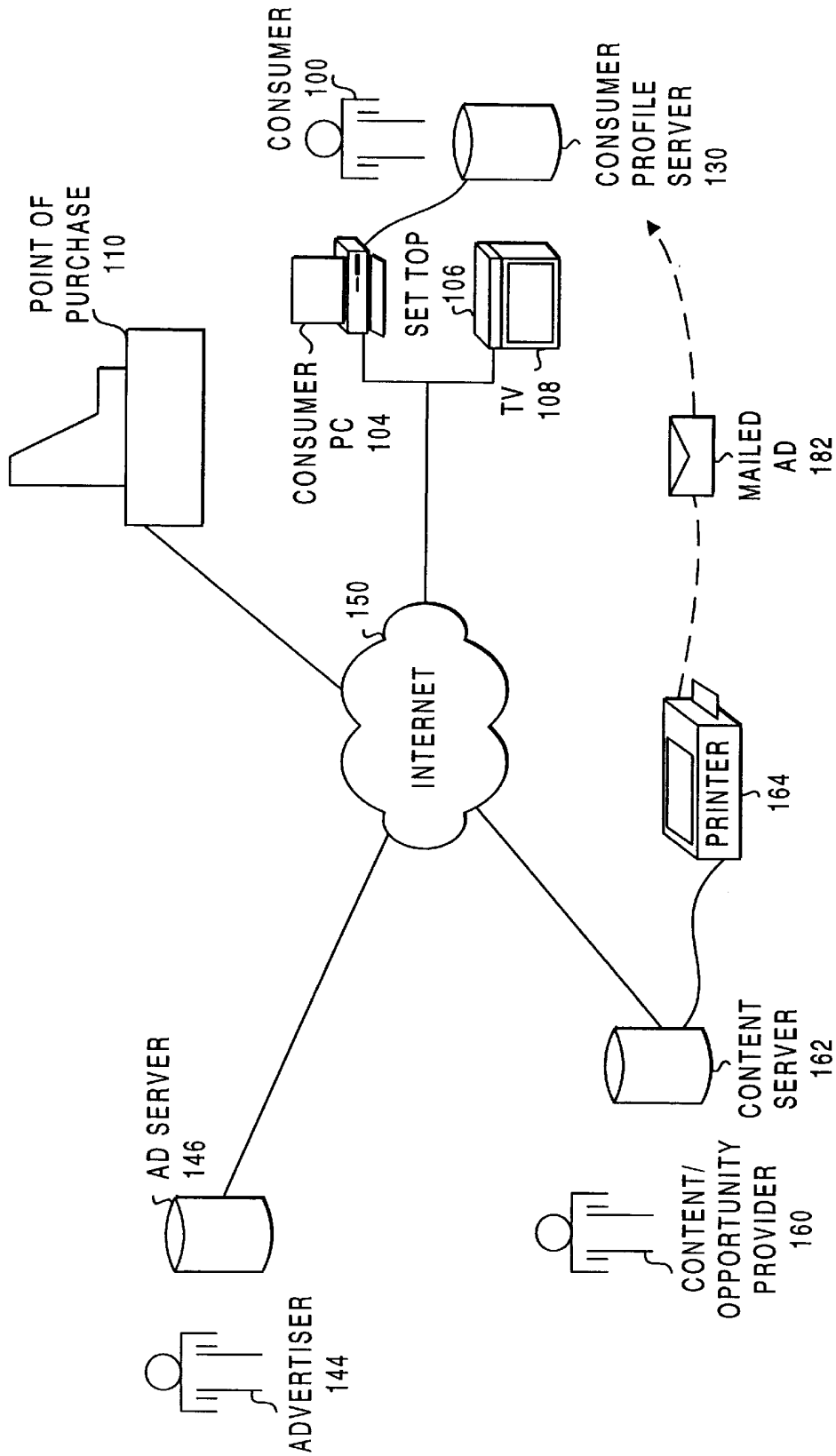


FIG. 1B

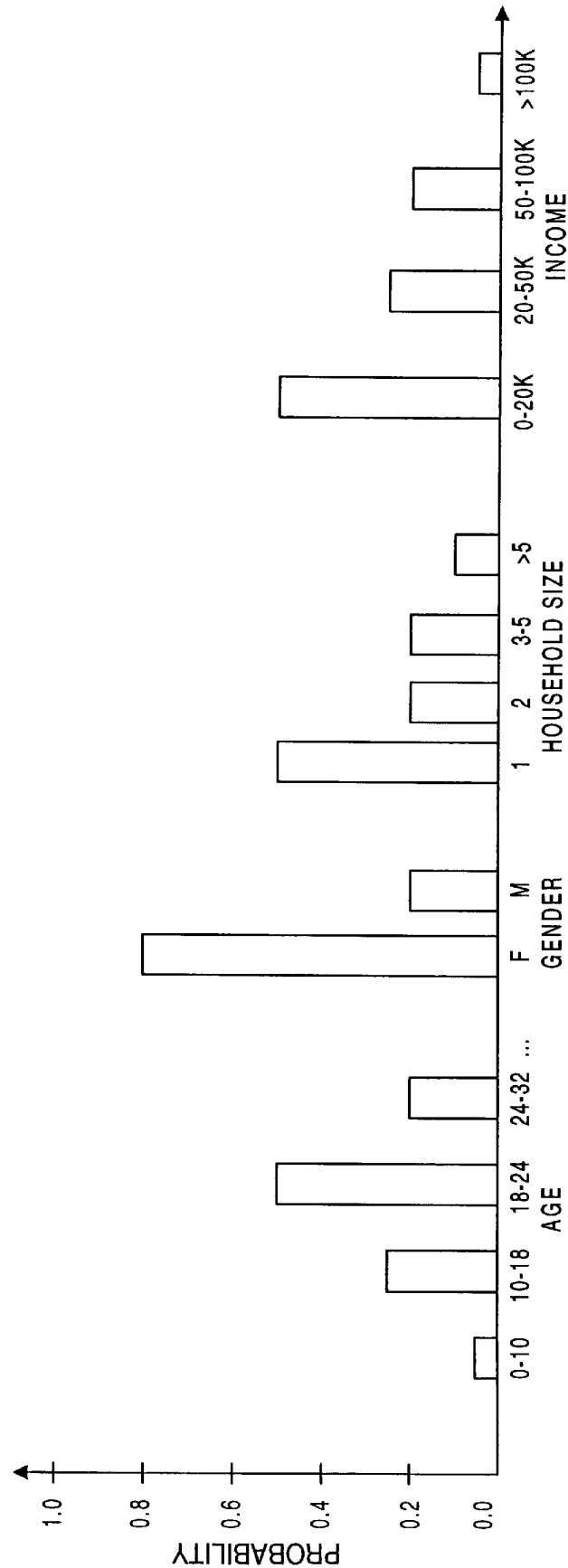


FIG. 2A

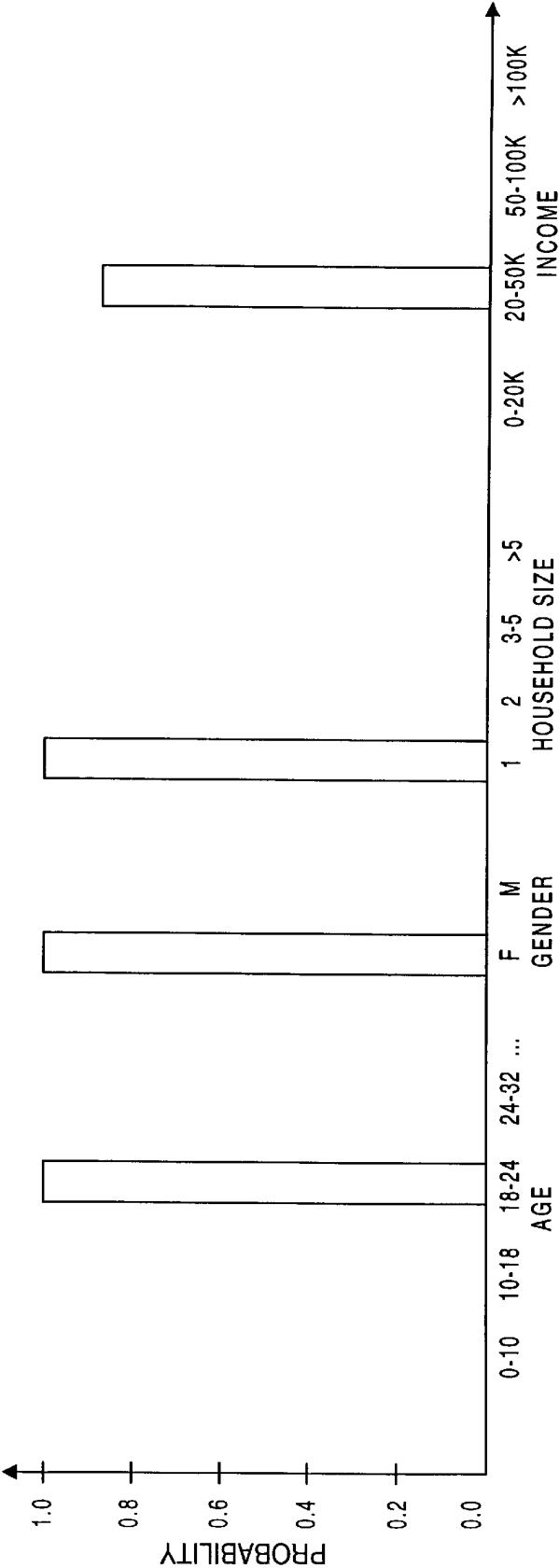


FIG. 2B



FIG. 2C

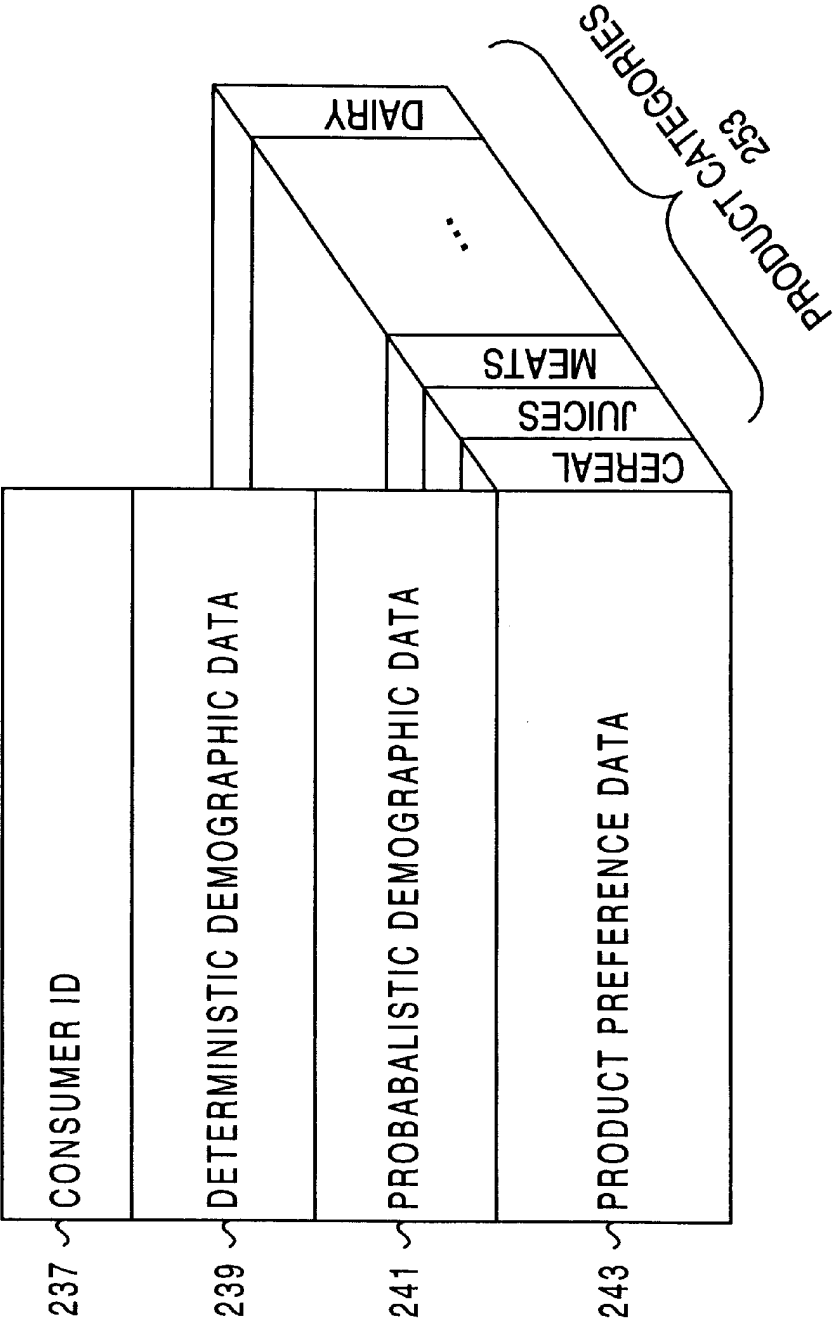


FIG. 2D

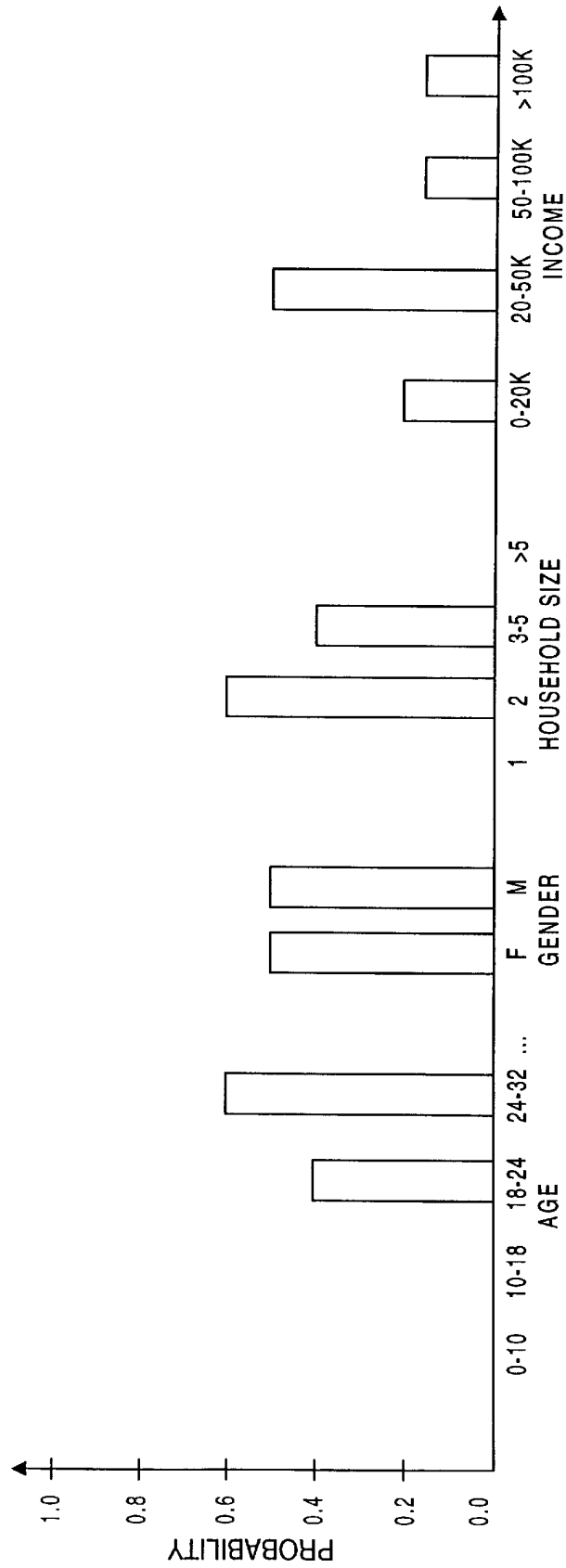


FIG. 3A

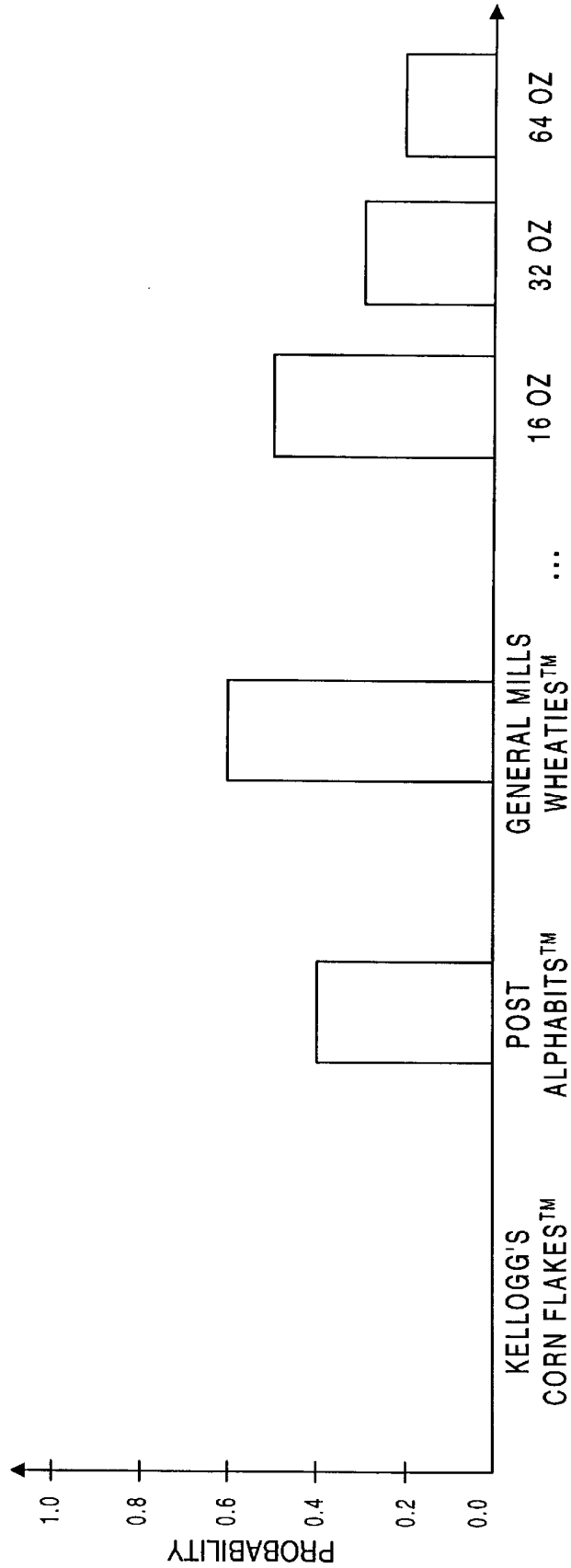


FIG. 3B

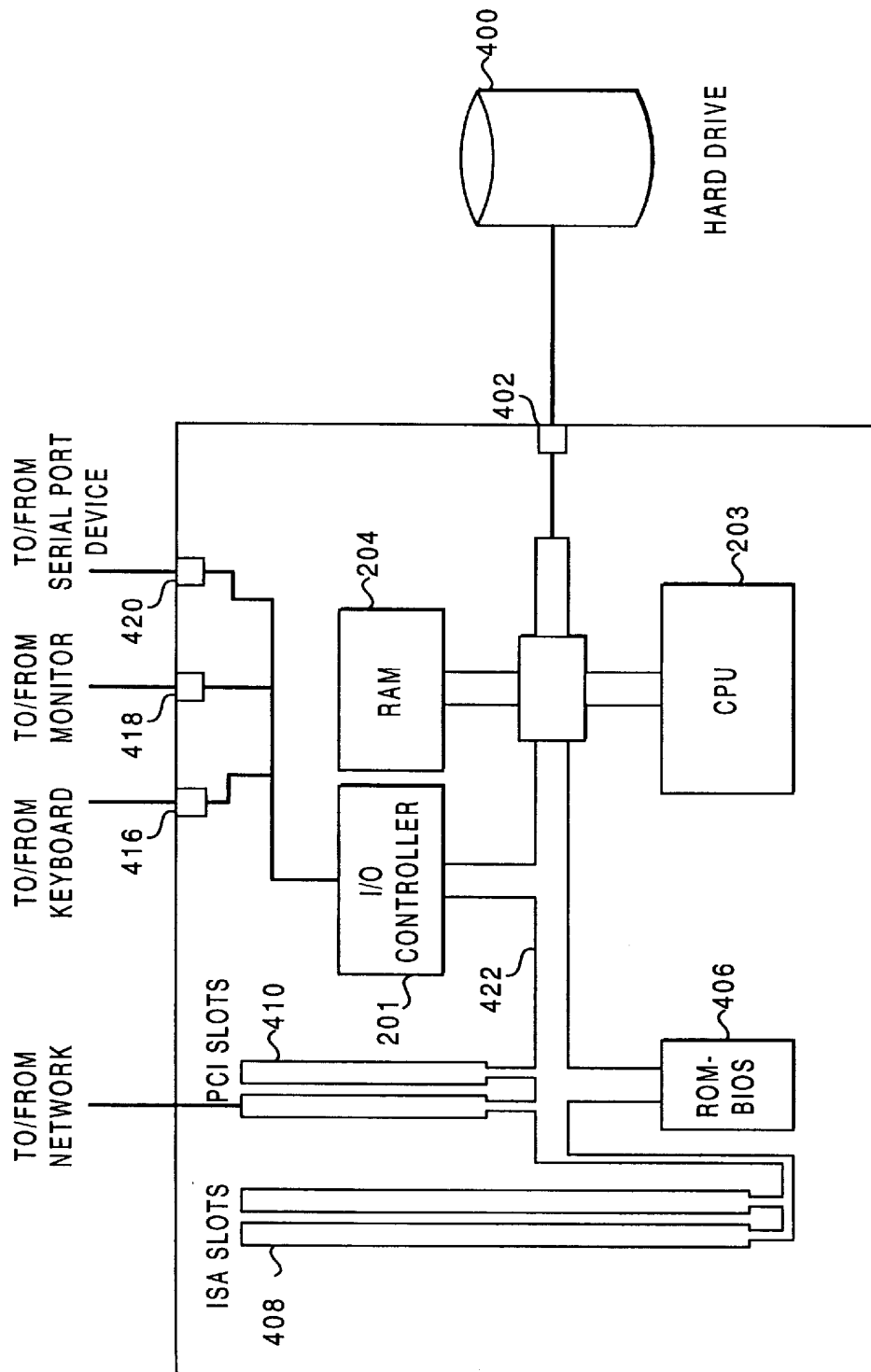


FIG. 4

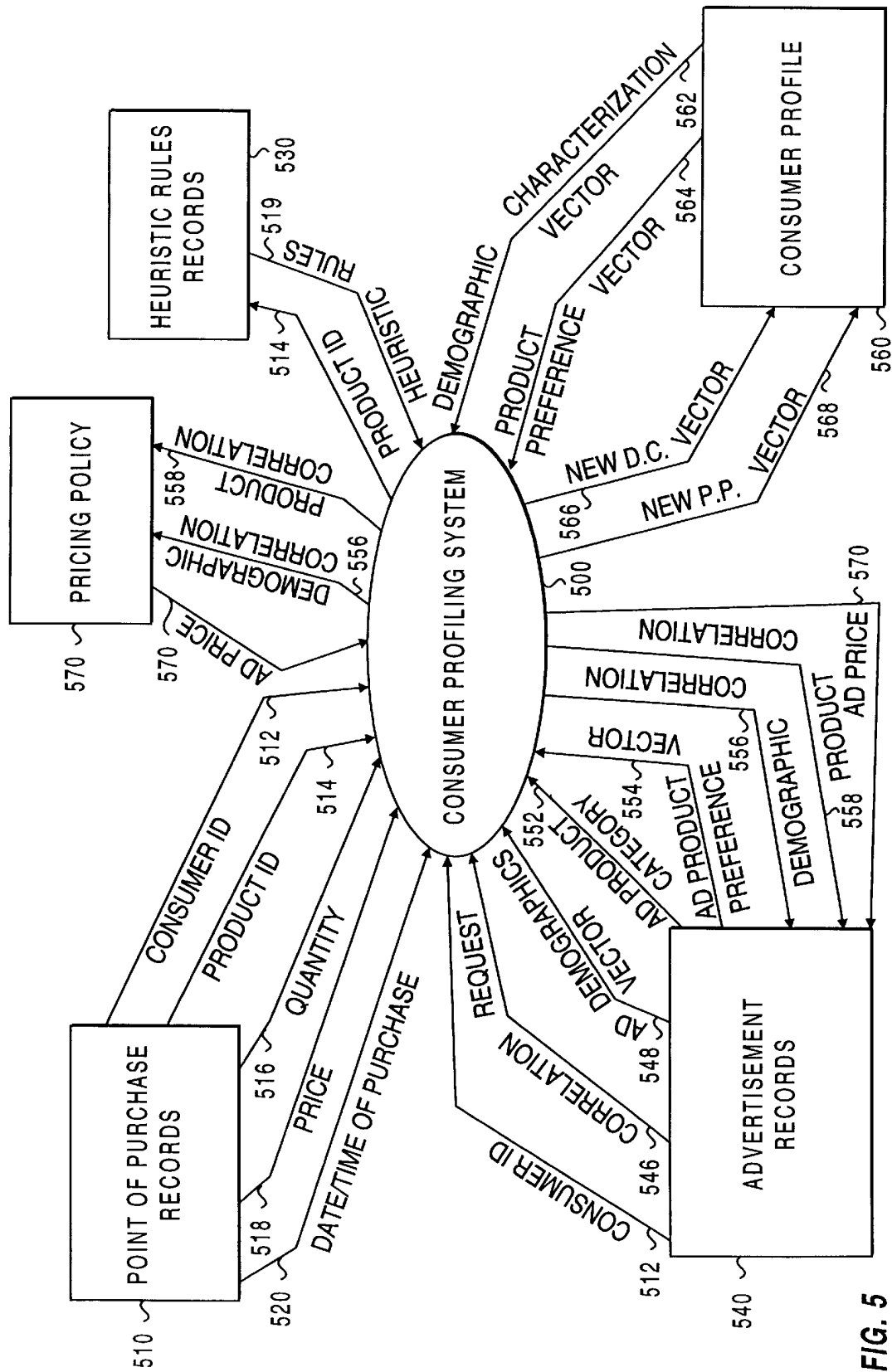


FIG. 5

```
READ POP DATA
FOR N=1 TO M
  READ PRODUCT ID
  RETRIEVE [PRODUCT DEMOGRAPHICS VECTOR]
  RETRIEVE [DEMOGRAPHIC CHARACTERIZATION VECTOR]
  RETRIEVE [PRODUCT PREFERENCE VECTOR]
  WEIGHT = PRODUCT TOTAL PURCHASE/PRODUCT CATEGORY
    TOTAL PURCHASE
  HOUSEHOLD DEMOGRAPHICS VECTOR =
    (WEIGHT) * (PRODUCT DEMOGRAPHICS VECTOR) +
    (DEMOGRAPHIC CHARACTERIZATION VECTOR)
  NORMALIZE [DEMOGRAPHIC CHARACTERIZATION VECTOR]
  STORE [DEMOGRAPHIC CHARACTERIZATION VECTOR]
  PRODUCT PREFERENCE VECTOR =
    (WEIGHT * PRODUCT PURCHASE VECTOR) + (PRODUCT
    PREFERENCE VECTOR)
  NORMALIZE [PRODUCT PREFERENCE VECTOR]
  STORE [PRODUCT PREFERENCE VECTOR]
NEXT M
```

FIG. 6A

READ [AD DEMOGRAPHIC VECTOR]
READ [AD PRODUCT CATEGORY, AD PRODUCT PREFERENCE VECTOR]
RETRIEVE [DEMOGRAPHIC CHARACTERIZATION VECTOR]
RETRIEVE [PRODUCT PREFERENCE VECTOR (PRODUCT CATEGORY)]
DEMOGRAPHIC CORRELATION = CORRELATE [DEMOGRAPHIC
CHARACTERIZATION VECTOR, AD DEMOGRAPHIC VECTOR]
PRODUCT PREFERENCE CORRELATION = CORRELATE [AD PRODUCT
PREFERENCE VECTOR, PRODUCT PREFERENCE VECTOR]
RETURN [DEMOGRAPHIC CORRELATION]
RETURN [PRODUCT PREFERENCE CORRELATION]

FIG. 6B

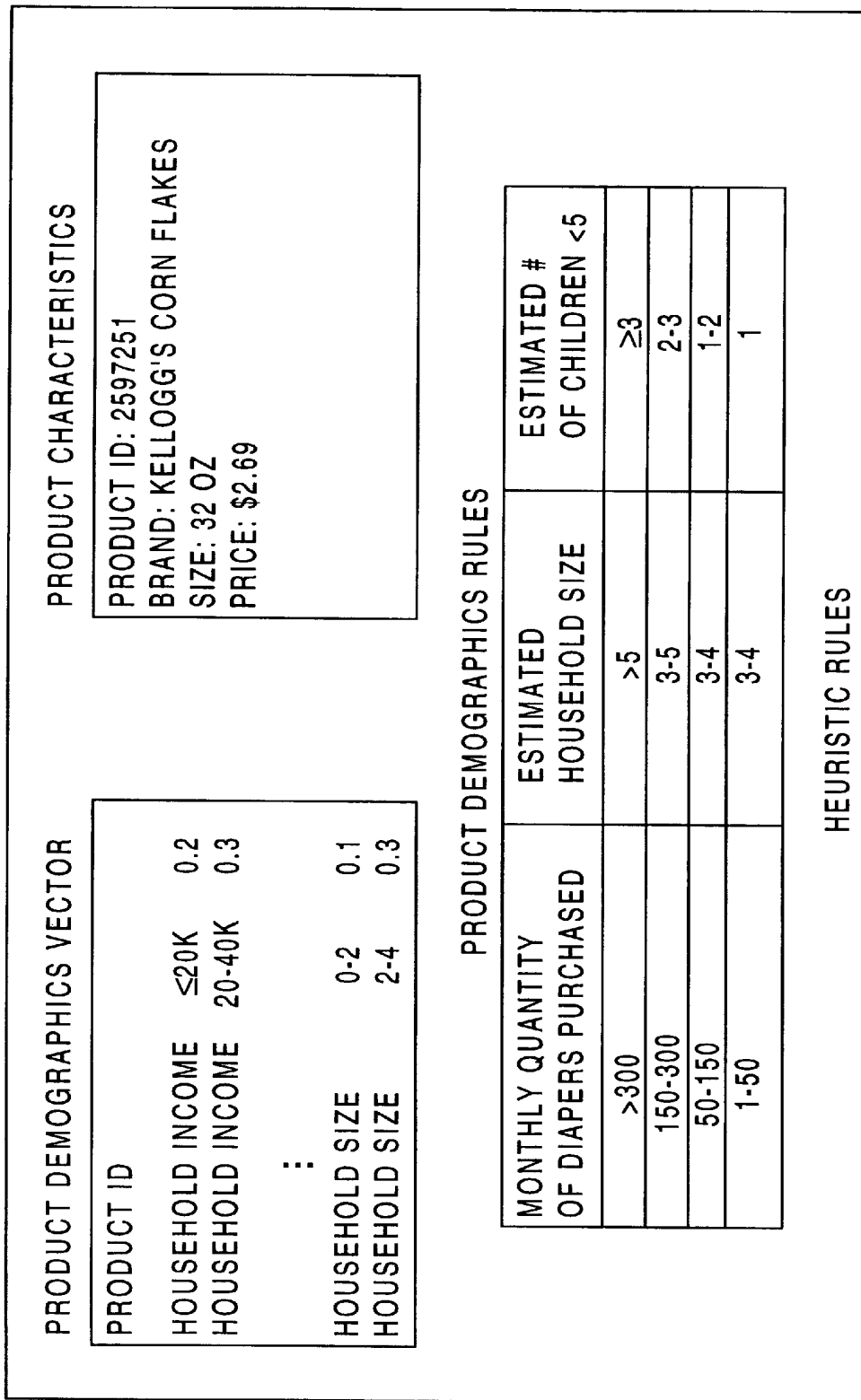


FIG. 7

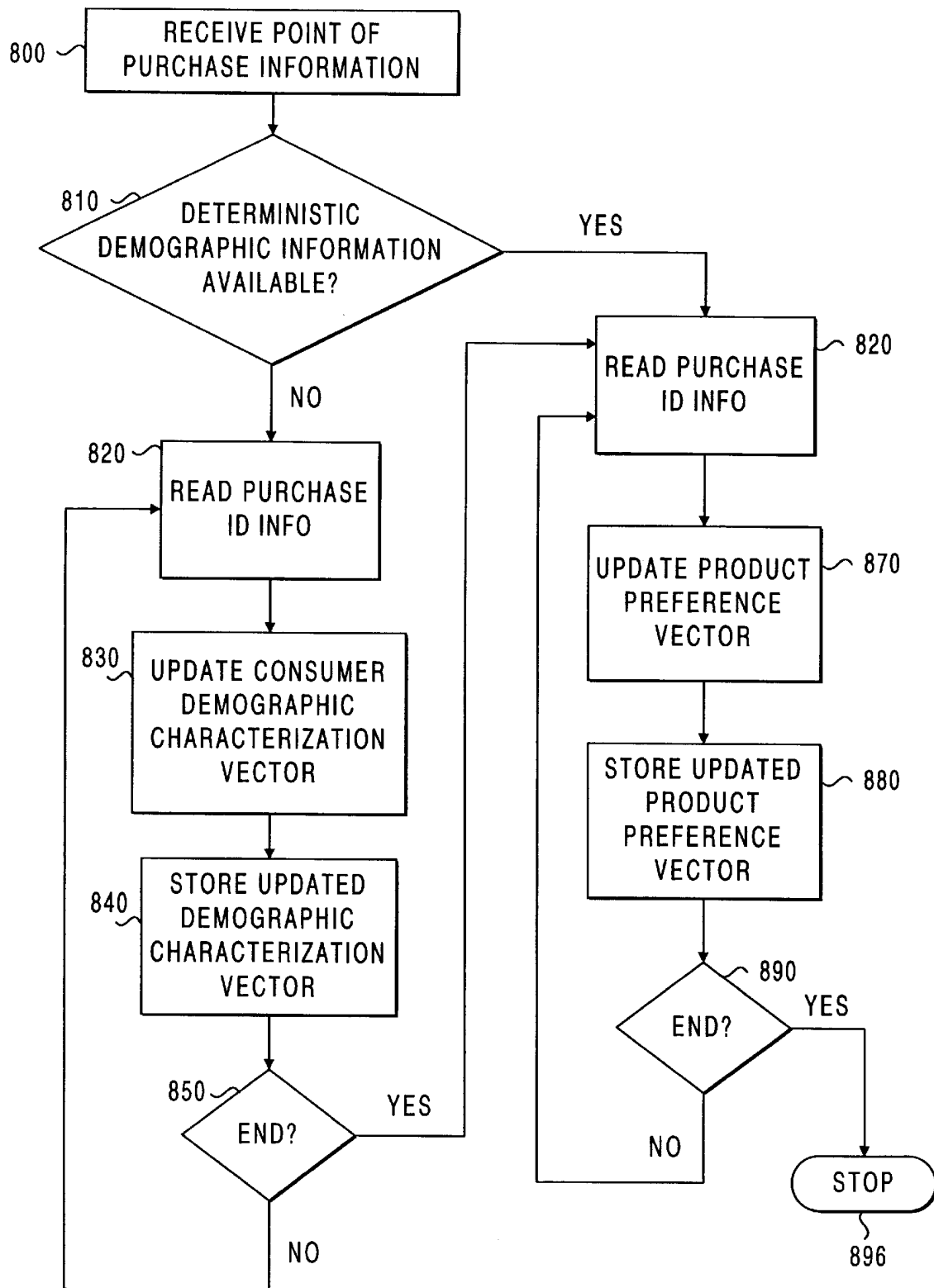


FIG. 8A

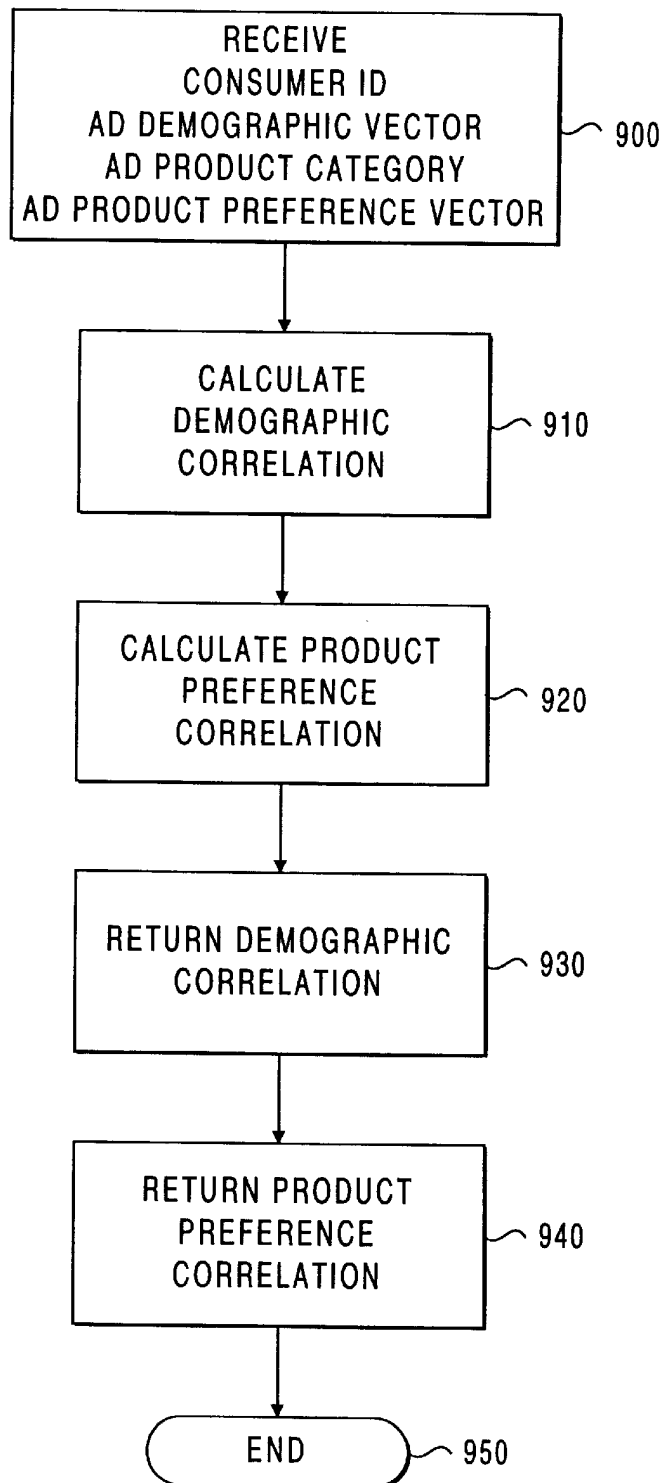


FIG. 8B

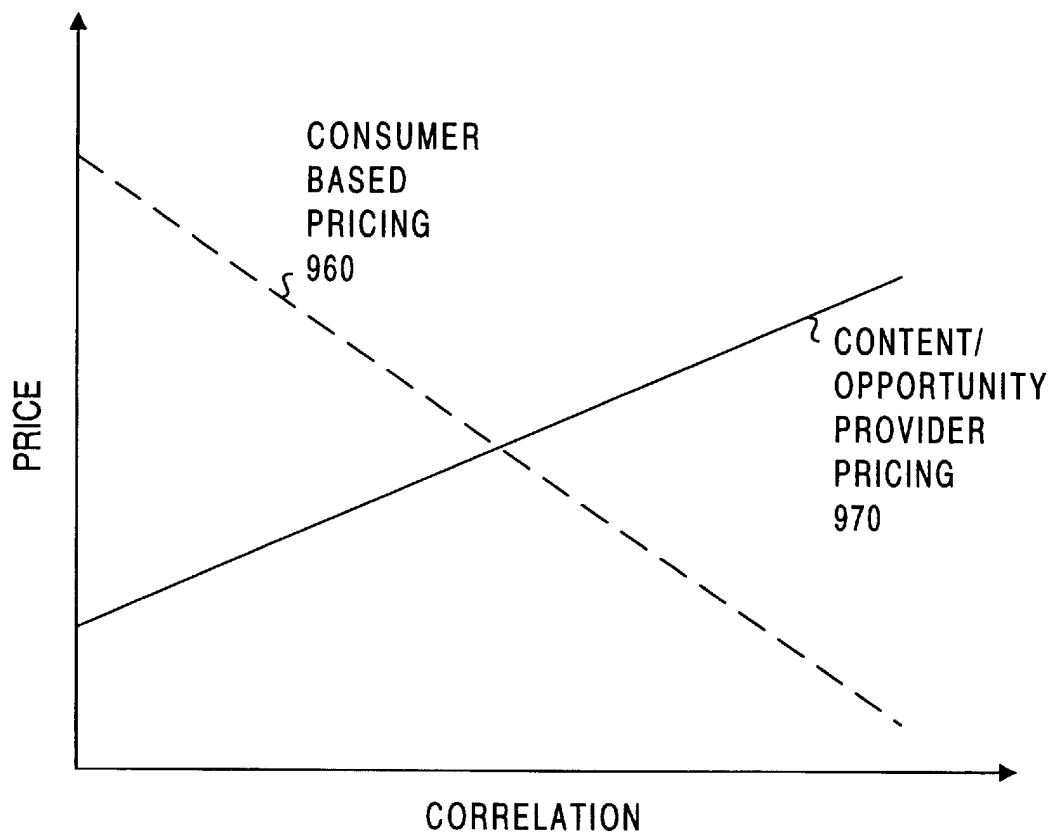


FIG. 9

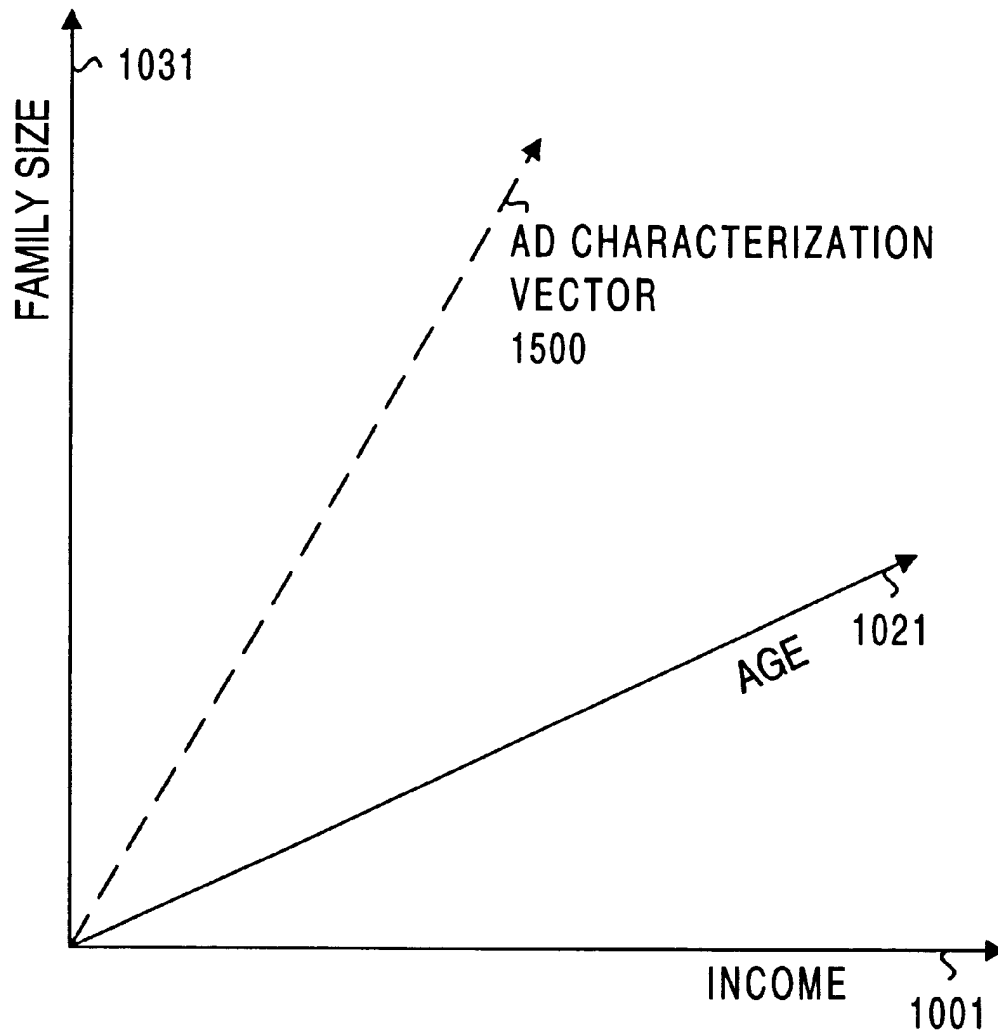


FIG. 10

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ADVERTISEMENT SELECTION SYSTEM SUPPORTING DISCRETIONARY TARGET MARKET CHARACTERISTICS

This application is a continuation-in-part of co-pending U.S. patent application Ser. No. 09/205,653 filed on Dec. 3, 1998.

BACKGROUND OF THE INVENTION

The advent of the Internet has resulted in the ability to communicate data across the globe instantaneously, and will allow for numerous new applications which enhance consumer's lives. One of the enhancements which can occur is the ability for the consumer to receive advertising which is relevant to their lifestyle, rather than a stream of ads determined by the program they are watching. Such "targeted ads" can potentially reduce the amount of unwanted information which consumers receive in the mail, during television programs, and when using the Internet.

From an advertiser's perspective the ability to target ads can be beneficial since they have some confidence that their ad will at least be determined relevant by the consumer, and therefore will not be found annoying because it is not applicable to their lifestyle.

In order to determine the applicability of an advertisement to a consumer, it is necessary to know something about their lifestyle, and in particular to understand their demographics (age, household size, income). In some instances it is useful to know their particular purchasing habits. As an example, a vendor of soups would like to know which consumers are buying their competitor's soup, so that they can target ads at those consumers in an effort to convince them to switch brands. That vendor will probably not want to target loyal customers, although for a new product introduction the strategy may be to convince loyal customers to try the new product. In both cases it is extremely useful for the vendor to be able to determine what brand of product the consumer presently purchases.

There are several difficulties associated with the collection, processing, and storage of consumer data. First, collecting consumer data and determining the demographic parameters of the consumer can be difficult. Surveys can be performed, and in some instances the consumer will willingly give access to normally private data including family size, age of family members, and household income. In such circumstances there generally needs to be an agreement with the consumer regarding how the data will be used. If the consumer does not provide this data directly, the information must be "mined" from various pieces of information which are gathered about the consumer, typically from specific purchases.

Once data is collected, usually from one source, some type of processing can be performed to determine a particular aspect of the consumer's life. As an example, processing can be performed on credit data to determine which consumers are a good credit risk and have recently applied for credit. The resulting list of consumers can be solicited, typically by direct mail.

Although information such as credit history is stored on multiple databases, storage of other information such as the specifics of grocery purchases is not typically performed. Even if each individual's detailed list of grocery purchases was recorded, the information would be of little use since it would amount to nothing more than unprocessed shopping lists.

Privacy concerns are also an important factor in using consumer purchase information. Consumers will generally

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find it desirable that advertisements and other information is matched with their interests, but will not allow indiscriminate access to their demographic profile and purchase records.

The Internet has spawned the concept of "negatively priced information" in which consumers can be paid to receive advertising. Paying consumers to watch advertisements can be accomplished interactively over the Internet, with the consumer acknowledging that they will watch an advertisement for a particular price. Previously proposed schemes such as that described in U.S. Pat. No. 5,794,210, entitled "Attention Brokerage," of which A. Nathaniel Goldhaber and Gary Fitts are the inventors, describe such a system, in which the consumer is presented with a list of advertisements and their corresponding payments. The consumer chooses from the list and is compensated for viewing the advertisement. The system requires real-time interactivity in that the viewer must select the advertisement from the list of choices presented.

The ability to place ads to consumers and compensate them for viewing the advertisements opens many possibilities for new models of advertising. However, it is important to understand the demographics and product preferences of the consumer in order to be able to determine if an advertisement is appropriate.

Although it is possible to collect statistical information regarding consumers of particular products and compare those profiles against individual demographic data points of consumers, such a methodology only allows for selection of potential consumers based on the demographics of existing customers of the same or similar products. U.S. Pat. No. 5,515,098, entitled "System and method for selectively distributing commercial messages over a communications network," of which John B. Carles is the inventor, describes a method in which target household data of actual customers of a product are compared against subscriber household data to determine the applicability of a commercial to a household. It will frequently be desirable to target an advertisement to a market having discretionary characteristics and to obtain a measure of the correlation of these discretionary features with probabilistic or deterministic data of the consumer/subscriber, rather than being forced to rely on the characteristics of existing consumers of a product. Such correlations should be possible based both on demographic characteristics and product preferences.

Another previously proposed system, described in U.S. Pat. No. 5,724,521, entitled "Method and apparatus for providing electronic advertisements to end users in a consumer best-fit pricing manner," of which R. Dedrick is the inventor, utilizes a consumer scale as the mechanism to determine to which group and advertisement is intended. Such a system requires specification of numerous parameters and weighting factors, and requires access to specific and non-statistical personal profile information.

For the foregoing reasons, there is a need for an advertisement selection system which can match an advertisement with discretionary target market characteristics, and which can do so in a manner which protects the privacy of the consumer data and characterizations.

SUMMARY OF THE INVENTION

The present invention describes a system for determining the applicability of an advertisement to a consumer, based on the reception of an ad characterization vector and use of a unique consumer ID. The consumer ID is used to retrieve a consumer characterization vector, and the correlation

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between the consumer characterization vector and the ad characterization vector is used to determine the applicability of the advertisement to the consumer. The price to be paid for presentation of the advertisement can be determined based on the degree of correlation.

The price to present an advertisement can increase with correlation, as may be typical when the content/opportunity provider is also the profiling entity. The price can decrease with correlation when the consumer is the profiler, and is interested in, and willing to charge less for seeing advertisements which are highly correlated with their demographics, lifestyle, and product preferences.

The present invention can be used to specify purchasers of a specific product. In a preferred embodiment the advertisement characterization vector contains a description of a target market including an indicator of a target product, i.e., purchasers of a particular product type, brand, or product size. The advertisement characterization vector is correlated with a consumer characterization vector which is retrieved based on a unique consumer ID. The correlation factor is determined and indicates if the consumer is a purchaser of the product the advertisement is intended for. This feature can be used to identify purchasers of a particular brand and can be used to target ads at those consumers to lure them away from their present product provider. Similarly, this feature can be used to target ads to loyal consumers to introduce them to a new product in a product family, or different size of product.

One advantage of the present invention is that discretionary target market parameters can be specified and do not necessarily need to correspond to an existing market, but can reflect the various market segments for which the advertisement is targeted. The market segments can be designated by demographic characteristics or by product preferences.

Another advantage of the present invention is that demographic samples of present purchasers of a product are not required to define the target market.

The present invention can be used to determine the applicability of an advertisement to a consumer based on demographics, product preferences, or a combination of both.

In a preferred embodiment of the present invention the correlation is calculated as the scalar product of the ad characterization vector and the consumer characterization vector. The ad characterization vector and consumer characterization vector can be composed of demographic characteristics, product purchase characteristics, or a combination of both.

In a preferred embodiment pricing for the displaying of said advertisement is developed based on the result of the correlation between the ad characterization vector and the consumer characterization vector. In a first embodiment the pricing increases as a function of the correlation. This embodiment can represent the situation in which the party which determines the correlation also controls the ability to display the advertisement.

In an alternate embodiment the price for displaying the advertisement decreases as a function of the degree of correlation. This embodiment can represent the situation in which the consumer controls access to the consumer characterization vector, and charges less to view advertisements which are highly correlated with their interests and demographics. A feature of this embodiment is the ability of the consumer to decrease the number of unwanted advertisements by charging a higher price to view advertisements which are likely to be of less interest.

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One advantage of the present invention is that it allows advertisements to be directed to new markets by setting specific parameters in the ad characterization vector, and does not require specific statistical knowledge regarding existing customers of similar products. Another advantage is that the system allows ads to be directed at consumers of a competing brand, or specific targeting at loyal customers. This feature can be useful for the introduction of a new product to an existing customer base.

Another advantage of the present invention is that the correlation can be performed by calculating a simple scalar (dot) product of the ad characterization and consumer characterization vectors. A weighted sum or other statistical analysis is not required to determine the applicability of the advertisement.

The present invention can be realized as a data processing system and as a computer program. The invention can be realized on an individual computer or can be realized using distributed computers with portions of the system operating on various computers.

An advantage of the present invention is the ability to direct advertisements to consumers which will find the advertisements of interest. This eliminates unwanted advertisements. Another advantage is the ability of advertisers to target specific groups of potential customers.

These and other features and objects of the invention will be more fully understood from the following detailed description of the preferred embodiments which should be read in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and form a part of the specification, illustrate the embodiments of the present invention and, together with the description serve to explain the principles of the invention.

In the drawings:

FIGS. 1A and 1B show user relationship diagrams for the present invention;

FIGS. 2A, 2B, 2C and 2D illustrate a probabilistic consumer demographic characterization vector, a deterministic consumer demographic characterization vector, a consumer product preference characterization vector, and a storage structure for consumer characterization vectors respectively;

FIGS. 3A and 3B illustrate an advertisement demographic characterization vector and an advertisement product preference characterization vector respectively;

FIG. 4 illustrates a computer system on which the present invention can be realized;

FIG. 5 illustrates a context diagram for the present invention;

FIGS. 6A and 6B illustrate pseudocode updating the characteristics vectors and for a correlation operation respectively;

FIG. 7 illustrates heuristic rules;

FIGS. 8A and 8B illustrate flowcharts for updating consumer characterization vectors and a correlation operation respectively; and

FIG. 9 represents pricing as a function of correlation.

FIG. 10 illustrates a representation of a consumer characterization as a set of basis vectors and an ad characterization vector.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In describing a preferred embodiment of the invention illustrated in the drawings, specific terminology will be used

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for the sake of clarity. However, the invention is not intended to be limited to the specific terms so selected, and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose.

With reference to the drawings, in general, and FIGS. 1 through 10 in particular, the method and apparatus of the present invention is disclosed.

FIG. 1A shows a user relationship diagram which illustrates the relationships between a consumer profiling system and various entities. As can be seen in FIG. 1, a consumer 100 can receive information and advertisements from a consumer personal computer (PC) 104, displayed on a television 108 which is connected to a settop 106, or can receive a mailed ad 182.

Advertisements and information displayed on consumer PC 104 or television 108 can be received over an Internet 150, or can be received over the combination of the Internet 150 with another telecommunications access system. The telecommunications access system can include but is not limited to cable TV delivery systems, switched digital video access systems operating over telephone wires, microwave telecommunications systems, or any other medium which provides connectivity between the consumer 100 and a content server 162 and ad server 146.

A content/opportunity provider 160 maintains the content server 162 which can transmit content including broadcast programming across a network such as the Internet 150. Other methods of data transport can be used including private data networks and can connect the content sever 160 through an access system to a device owned by consumer 100.

Content/opportunity provider 160 is termed such since if consumer 100 is receiving a transmission from content server 162, the content/opportunity provider can insert an advertisement. For video programming, content/opportunity provider is typically the cable network operator or the source of entertainment material, and the opportunity is the ability to transmit an advertisement during a commercial break.

The majority of content that is being transmitted today is done so in broadcast form, such as broadcast television programming (broadcast over the air and via cable TV networks), broadcast radio, and newspapers. Although the interconnectivity provided by the Internet will allow consumer specific programming to be transmitted, there will still be a large amount of broadcast material which can be sponsored in part by advertising. The ability to insert an advertisement in a broadcast stream (video, audio, or mailed) is an opportunity for advertiser 144. Content can also be broadcast over the Internet and combined with existing video services, in which case opportunities for the insertion of advertisements will be present.

Although FIG. 1A represents content/opportunity provider 160 and content server 162 as being independently connected to Internet 150, with the consumer's devices also being directly connected to the Internet 150, the content/opportunity provider 160 can also control access to the subscriber. This can occur when the content/opportunity provider is also the cable operator or telephone company. In such instances, the cable operator or telephone company can be providing content to consumer 100 over the cable operator/telephone company access network. As an example, if the cable operator has control over the content being transmitted to the consumer 100, and has programmed times for the insertion of advertisements, the cable operator is considered to be a content/opportunity provider 160 since

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the cable operator can provide advertisers the opportunity to access consumer 100 by inserting an advertisement at the commercial break.

In a preferred embodiment of the present invention, a pricing policy can be defined. The content/opportunity provider 160 can charge advertiser 144 for access to consumer 100 during an opportunity. In a preferred embodiment the price charged for access to consumer 100 by content/opportunity provider varies as a function of the applicability of the advertisement to consumer 100. In an alternate embodiment consumer 100 retains control of access to the profile and charges for viewing an advertisement.

The content provider can also be a mailing company or printer which is preparing printed information for consumer 100. As an example, content server 162 can be connected to a printer 164 which creates a mailed ad 182 for consumer 100. Alternatively, printer 164 can produce advertisements for insertion into newspapers which are delivered to consumer 100. Other printed material can be generated by printer 162 and delivered to consumer 100 in a variety of ways.

Advertiser 144 maintains an ad server 146 which contains a variety of advertisements in the form of still video which can be printed, video advertisements, audio advertisements, or combinations thereof.

Profiler 140 maintains a consumer profile server 130 which contains the characterization of consumer 100. The consumer profiling system is operated by profiler 140, who can use consumer profile server 130 or another computing device connected to consumer profile server 130 to profile consumer 100.

Data to perform the consumer profiling is received from a point of purchase 110. Point of purchase 110 can be a grocery store, department store, other retail outlet, or can be a web site or other location where a purchase request is received and processed. In a preferred embodiment, data from the point of purchase is transferred over a public or private network 120, such as a local area network within a store or a wide area network which connects a number of department or grocery stores. In an alternate embodiment the data from point of purchase 110 is transmitted over the Internet 150 to profiler 140.

Profiler 140 may be a retailer who collects data from its stores, but can also be a third party who contracts with consumer 100 and the retailer to receive point of purchase data and to profile the consumer 100. Consumer 100 may agree to such an arrangement based on the increased convenience offered by targeted ads, or through a compensation arrangement in which they are paid on a periodic basis for revealing their specific purchase records.

Consumer profile server 130 can contain a consumer profile which is determined from observation of the consumer's viewing habits on television 108 or consumer PC 104. A method and apparatus for determining demographic and product preference information based on the consumer's use of services such as cable television and Internet access is described in the co-pending application entitled "Subscriber characterization system," filed on Dec. 3, 1998, with Ser. No. 09/204,888 and in the co-pending application entitled "Client-server based subscriber characterization system," filed on Dec. 3, 1998, with Ser. No. 09/205,653, both of which are incorporated herein by reference but which are not admitted to be prior art. When used herein, the term consumer characterization vector also represents the subscriber characterization vector described in the aforementioned applications. Both the consumer characterization

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vector and the subscriber characterization vector contain demographic and product preference information which is related to consumer **100**.

FIG. 1B illustrates an alternate embodiment of the present invention in which the consumer **100** is also profiler **140**. Consumer **100** maintains consumer profile server **130** which is connected to a network, either directly or through consumer PC **104** or settop **106**. Consumer profile server **130** can contain the consumer profiling system, or the profiling can be performed in conjunction with consumer PC **104** or settop **106**. A subscriber characterization system which monitors the viewing habits of consumer **100** can be used in conjunction with the consumer profiling system to create a more accurate consumer profile.

When the consumer **100** is also the profiler **140**, as shown in FIG. 1B, access to the consumer demographic and product preference characterization is controlled exclusively by consumer **100**, who will grant access to the profile in return for receiving an increased accuracy of ads, for cash compensation, or in return for discounts or coupons on goods and services.

FIG. 2A illustrates an example of a probabilistic demographic characterization vector. The demographic characterization vector is a representation of the probability that a consumer falls within a certain demographic category such as an age group, gender, household size, or income range.

In a preferred embodiment the demographic characterization vector includes interest categories. The interest categories may be organized according to broad areas such as music, travel, and restaurants. Examples of music interest categories include country music, rock, classical, and folk. Examples of travel categories include "travels to another state more than twice a year," and travels by plane more than twice a year."

FIG. 2B illustrates a deterministic demographic characterization vector. The deterministic demographic characterization vector is a representation of the consumer profile as determined from deterministic rather than probabilistic data. As an example, if consumer **100** agrees to answer specific questions regarding age, gender, household size, income, and interests the data contained in the consumer characterization vector will be deterministic.

As with probabilistic demographic characterization vectors, the deterministic demographic characterization vector can include interest categories. In a preferred embodiment, consumer **100** answers specific questions in a survey generated by profiler **140** and administered over the phone, in written form, or via the Internet **150** and consumer PC **104**. The survey questions correspond either directly to the elements in the probabilistic demographic characterization vector, or can be processed to obtain the deterministic results for storage in the demographic characterization vector.

FIG. 2C illustrates a product preference vector. The product preference represents the average of the consumer preferences over past purchases. As an example, a consumer who buys the breakfast cereal manufactured by Post under the trademark ALPHABITS about twice as often as purchasing the breakfast cereal manufactured by Kellogg under the trademark CORN FLAKES, but who never purchases breakfast cereal manufactured by General Mills under the trademark WHEATIES, would have a product preference characterization such as that illustrated in FIG. 2C. As shown in FIG. 2C, the preferred size of the consumer purchase of a particular product type can also be represented in the product preference vector.

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FIG. 2D represents a data structure for storing the consumer profile, which can be comprised of a consumer ID field **237**, a deterministic demographic data field **239**, a probabilistic demographic data field **241**, and one or more product preference data fields **243**. As shown in FIG. 2D, the product preference data field **243** can be comprised of multiple fields arranged by product categories **253**.

Depending on the data structure used to store the information contained in the vector, any of the previously mentioned vectors may be in the form of a table, record, linked tables in a relational database, series of records, or a software object.

The consumer ID **512** can be any identification value uniquely associated with consumer **100**. In a preferred embodiment consumer ID **512** is a telephone number, while in an alternate embodiment consumer ID **512** is a credit card number. Other unique identifiers include consumer name with middle initial or a unique alphanumeric sequence, the consumer address, social security number.

The vectors described and represented in FIGS. 2A–C form consumer characterization vectors that can be of varying length and dimension, and portions of the characterization vector can be used individually. Vectors can also be concatenated or summed to produce longer vectors which provide a more detailed profile of consumer **100**. A matrix representation of the vectors can be used, in which specific elements, such as product categories **253**, are indexed. Hierarchical structures can be employed to organize the vectors and to allow hierarchical search algorithms to be used to locate specific portions of vectors.

FIGS. 3A and 3B represent an ad demographics vector and an ad product preference vector respectively. The ad demographics vector, similar in structure to the demographic characterization vector, is used to target the ad by setting the demographic parameters in the ad demographics vector to correspond to the targeted demographic group. As an example, if an advertisement is developed for a market which is the 18–24 and 24–32 age brackets, no gender bias, with a typical household size of 2–5, and income typically in the range of \$20,000–\$50,000, the ad demographics vector would resemble the one shown in FIG. 3A. The ad demographics vector represents a statistical estimate of who the ad is intended for, based on the advertisers belief that the ad will be beneficial to the manufacturer when viewed by individuals in those groups. The benefit will typically be in the form of increased sales of a product or increased brand recognition. As an example, an "image ad" which simply shows an artistic composition but which does not directly sell a product may be very effective for young people, but may be annoying to older individuals. The ad demographics vector can be used to establish the criteria which will direct the ad to the demographic group of 18–24 year olds.

FIG. 3B illustrates an ad product preference vector. The ad product preference vector is used to select consumers which have a particular product preference. In the example illustrated in FIG. 3B, the ad product preference vector is set so that the ad can be directed at purchasers of ALPHABITS and WHEATIES, but not at purchasers of CORN FLAKES. This particular setting would be useful when the advertiser represents Kellogg and is charged with increasing sales of CORN FLAKES. By targeting present purchasers of ALPHABITS and WHEATIES, the advertiser can attempt to sway those purchasers over to the Kellogg brand and in particular convince them to purchase CORN FLAKES. Given that there will be a payment required to present the advertisement, in the form of a payment to the content/

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opportunity provider **160** or to the consumer **100**, the advertiser **144** desires to target the ad and thereby increase its cost effectiveness.

In the event that advertiser **144** wants to reach only the purchasers of Kellogg's CORN FLAKES, that category would be set at a high value, and in the example shown would be set to 1. As shown in FIG. 3B, product size can also be specified. If there is no preference to size category the values can all be set to be equal. In a preferred embodiment the values of each characteristic including brand and size are individually normalized.

Because advertisements can be targeted based on a set of demographic and product preference considerations which may not be representative of any particular group of present consumers of the product, the ad characterization vector can be set to identify a number of demographic groups which would normally be considered to be uncorrelated. Because the ad characterization vector can have target profiles which are not representative of actual consumers of the product, the ad characterization vector can be considered to have discretionary elements. When used herein the term discretionary refers to a selection of target market characteristics which need not be representative of an actual existing market or single purchasing segment.

In a preferred embodiment the consumer characterization vectors shown in FIGS. 2A–C and the ad characterization vectors represented in FIGS. 3A and 3B have a standardized format, in which each demographic characteristic and product preference is identified by an indexed position. In a preferred embodiment the vectors are singly indexed and thus represent coordinates in n-dimensional space, with each dimension representing a demographic or product preference characteristic. In this embodiment a single value represents one probabilistic or deterministic value (e.g. the probability that the consumer is in the 18–24 year old age group, or the weighting of an advertisement to the age group).

In an alternate embodiment a group of demographic or product characteristics forms an individual vector. As an example, age categories can be considered a vector, with each component of the vector representing the probability that the consumer is in that age group. In this embodiment each vector can be considered to be a basis vector for the description of the consumer or the target ad. The consumer or ad characterization is comprised of a finite set of vectors in a vector space that describes the consumer or advertisement.

FIG. 4 shows the block diagram of a computer system for a realization of the consumer profiling system. A system bus **422** transports data amongst the CPU **203**, the RAM **204**, Read Only Memory—Basic Input Output System (ROM-BIOS) **406** and other components. The CPU **203** accesses a hard drive **400** through a disk controller **402**. The standard input/output devices are connected to the system bus **422** through the I/O controller **201**. A keyboard is attached to the I/O controller **201** through a keyboard port **416** and the monitor is connected through a monitor port **418**. The serial port device uses a serial port **420** to communicate with the I/O controller **201**. Industry Standard Architecture (ISA) expansion slots **408** and Peripheral Component Interconnect (PCI) expansion slots **410** allow additional cards to be placed into the computer. In a preferred embodiment, a network card is available to interface a local area, wide area, or other network. The computer system shown in FIG. 4 can be part of consumer profile server **130**, or can be a processor present in another element of the network.

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FIG. 5 shows a context diagram for the present invention. Context diagrams are useful in illustrating the relationship between a system and external entities. Context diagrams can be especially useful in developing object oriented implementations of a system, although use of a context diagram does not limit implementation of the present invention to any particular programming language. The present invention can be realized in a variety of programming languages including but not limited to C, C++, Smalltalk, Java, Perl, and can be developed as part of a relational database. Other languages and data structures can be utilized to realize the present invention and are known to those skilled in the art.

Referring to FIG. 5, in a preferred embodiment consumer profiling system **500** is resident on consumer profile server **130**. Point of purchase records **510** are transmitted from point of purchase **110** and stored on consumer profile server **130**. Heuristic rules **530**, pricing policy **570**, and consumer profile **560** are similarly stored on consumer profile server **130**. In a preferred embodiment advertisement records **540** are stored on ad server **146** and connectivity between advertisement records **540** and consumer profiling system **500** is via the Internet or other network.

In an alternate embodiment the entities represented in FIG. 5 are located on servers which are interconnected via the Internet or other network.

Consumer profiling system **500** receives purchase information from a point of purchase, as represented by point of purchase records **510**. The information contained within the point of purchase records **510** includes a consumer ID **512**, a product ID **514** of the purchased product, the quantity **516** purchased and the price **518** of the product. In a preferred embodiment, the date and time of purchase **520** are transmitted by point of purchase records **510** to consumer profiling system **500**.

The consumer profiling system **500** can access the consumer profile **560** to update the profiles contained in it. Consumer profiling system **500** retrieves a consumer characterization vector **562** and a product preference vector **564**. Subsequent to retrieval one or more data processing algorithms are applied to update the vectors. An algorithm for updating is illustrated in the flowchart in FIG. 8A. The updated vectors termed herein as new demographic characterization vector **566** and new product preference **568** are returned to consumer profile **560** for storage.

Consumer profiling system **500** can determine probabilistic consumer demographic characteristics based on product purchases by applying heuristic rules **519**. Consumer profiling system **500** provides a product ID **514** to heuristic rules records **530** and receives heuristic rules associated with that product. Examples of heuristic rules are illustrated in FIG. 7.

In a preferred embodiment of the present invention, consumer profiling system **500** can determine the applicability of an advertisement to the consumer **100**. For determination of the applicability of an advertisement, a correlation request **546** is received by consumer profiling system **500** from advertisements records **540**, along with consumer ID **512**. Advertisements records **540** also provide advertisement characteristics including an ad demographic vector **548**, an ad product category **552** and an ad product preference vector **554**.

Application of a correlation process, as will be described in accordance with FIG. 8B, results in a demographic correlation **556** and a product correlation **558** which can be returned to advertisement records **540**. In a preferred embodiment, advertiser **144** uses product correlation **558**

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and demographic correlation **556** to determine the applicability of the advertisement and to determine if it is worth purchasing the opportunity. In a preferred embodiment, pricing policy **570** is utilized to determine an ad price **570** which can be transmitted from consumer profiling system **500** to advertisement records **540** for use by advertiser **144**.

Pricing policy **570** is accessed by consumer profiling system **500** to obtain ad price **572**. Pricing policy **570** takes into consideration results of the correlation provided by the consumer profiling system **500**. An example of pricing schemes are illustrated in FIG. **9**.

FIGS. **6A** and **6B** illustrate pseudocode for the updating process and for a correlation operation respectively. The updating process involves utilizing purchase information in conjunction with heuristic rules to obtain a more accurate representation of consumer **100**, stored in the form of a new demographic characterization vector **562** and a new product preference vector **568**.

As illustrated in the pseudocode in FIG. **6A** the point of purchase data are read and the products purchase are integrated into the updating process. Consumer profiling system **500** retrieves a product demographics vector obtained from the set of heuristic rules **519** and applies the product demographics vector to the demographics characterization vector **562** and the product preference vector **564** from the consumer profile **560**.

The updating process as illustrated by the pseudocode in FIG. **6A** utilizes a weighting factor which determines the importance of that product purchase with respect to all of the products purchased in a particular product category. In a preferred embodiment the weight is computed as the ratio of the total of products with a particular product ID **514** purchased at that time, to the product total purchase, which is the total quantity of the product identified by its product ID **514** purchased by consumer **100** identified by its consumer ID **512**, purchased over an extended period of time. In a preferred embodiment the extended period of time is one year.

In the preferred embodiment the product category total purchase is determined from a record containing the number of times that consumer **100** has purchased a product identified by a particular product ID.

In an alternate embodiment other types of weighting factors, running averages and statistical filtering techniques can be used to use the purchase data to update the demographic characterization vector. The system can also be reset to clear previous demographic characterization vectors and product preference vectors.

The new demographic characterization vector **566** is obtained as the weighted sum of the product demographics vector and the demographic characterization vector **562**. The same procedure is performed to obtain the new product preference vector **568**. Before storing those new vectors, a normalization is performed on the new vectors. When used herein the term product characterization information refers to product demographics vectors, product purchase vectors or heuristic rules, all of which can be used in the updating process. The product purchase vector refers to the vector which represents the purchase of a item represented by a product ID. As an example, a product purchase vector for the purchase of Kellogg's CORN FLAKES in a 32 oz. size has a product purchase vector with a unity value for Kellogg's CORN FLAKES and in the 32 oz. size. In the updating process the weighted sum of the purchase as represented by the product purchase vector is added to the product preference vector to update the product preference vector, increas-

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ing the estimated probability that the consumer will purchase Kellogg's CORN FLAKES in the 32 oz. size.

In FIG. **6B** the pseudocode for a correlation process is illustrated. Consumer profiling system **500**, after receiving the product characteristics and the consumer ID **512** from the advertisement records retrieves the consumer demographic characterization vector **562** and its product preference vector **564**. The demographic correlation is the correlation between the demographic characterization vector **562** and the ad demographics vector. The product correlation is the correlation between the ad product preference vector **554** and the product preference vector **564**.

In a preferred embodiment the correlation process involves computing the dot product between vectors. The resulting scalar is the correlation between the two vectors.

In an alternate embodiment, as illustrated in FIG. **10**, the basis vectors which describe aspects of the consumer can be used to calculate the projections of the ad vector on those basis vectors. In this embodiment, the result of the ad correlation can itself be in vector form whose components represent the degree of correlation of the advertisement with each consumer demographic or product preference feature. As shown in FIG. **10** the basis vectors are the age of the consumer **1021**, the income of the consumer **1001**, and the family size of the consumer **1031**. The ad characterization vector **1500** represents the desired characteristics of the target audience, and can include product preference as well as demographic characteristics.

In this embodiment the degree of orthogonality of the basis vectors will determine the uniqueness of the answer. The projections on the basis vectors form a set of data which represent the corresponding values for the parameter measured in the basis vector. As an example, if household income is one basis vector, the projection of the ad characterization vector on the household income basis vector will return a result indicative of the target household income for that advertisement.

Because basis vectors cannot be readily created from some product preference categories (e.g. cereal preferences) an alternate representation to that illustrated in FIG. **2C** can be utilized in which the product preference vector represents the statistical average of purchases of cereal in increasing size containers. This vector can be interpreted as an average measure of the cereal purchased by the consumer in a given time period.

The individual measurements of correlation as represented by the correlation vector can be utilized in determining the applicability of the advertisement to the subscriber, or a sum of correlations can be generated to represent the overall applicability of the advertisement.

In a preferred embodiment individual measurements of the correlations, or projections of the ad characteristics vector on the consumer basis vectors, are not made available to protect consumer privacy, and only the absolute sum is reported. In geometric terms this can be interpreted as disclosure of the sum of the lengths of the projections rather than the actual projections themselves.

In an alternate embodiment the demographic and product preference parameters are grouped to form sets of paired scores in which elements in the consumer characterization vector are paired with corresponding elements of the ad characteristics vector. A correlation coefficient such as the Pearson product-moment correlation can be calculated. Other methods for correlation can be employed and are well known to those skilled in the art.

When the consumer characterization vector and the ad characterization vector are not in a standardized format, a

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transformation can be performed to standardize the order of the demographic and product preferences, or the data can be decomposed into sets of basis vectors which indicate particular attributes such as age, income or family size.

FIG. 7 illustrates an example of heuristic rules including rules for defining a product demographics vector. From the product characteristics, a probabilistic determination of household demographics can be generated. Similarly, the monthly quantity purchased can be used to estimate household size. The heuristic rules illustrated in FIG. 7 serve as an example of the types of heuristic rules which can be employed to better characterize consumer 100 as a result of their purchases. The heuristic rules can include any set of logic tests, statistical estimates, or market studies which provide the basis for better estimating the demographics of consumer 100 based on their purchases.

In FIG. 8A the flowchart for updating the consumer characterization vectors is depicted. The system receives data from the point of purchase at receive point of purchase information step 800. The system performs a test to determine if a deterministic demographic characterization vector is available at deterministic demographic information available step 810 and, if not, proceeds to update the demographic characteristics.

Referring to FIG. 8A, at read purchase ID info step 820, the product ID 514 is read, and at update consumer demographic characterization vector step 830, an algorithm such as that represented in FIG. 6A is applied to obtain a new demographic characterization vector 566, which is stored in the consumer profile 560 at store updated demographic characterization vector step 840.

The end test step 850 can loop back to the read purchase ID info 820 if all the purchased products are not yet processed for updating, or continue to the branch for updating the product preference vector 564. In this branch, the purchased product is identified at read purchase ID info step 820. An algorithm, such as that illustrated in FIG. 6A for updating the product preference vector 564, is applied in update product preference vector step 870. The updated vector is stored in consumer profile 560 at store product preference vector step 880. This process is carried out until all the purchased items are integrated in the updating process.

FIG. 8B shows a flowchart for the correlation process. At step 900 the advertisement characteristics described earlier in accordance with FIG. 5 along with the consumer ID are received by consumer profiling system 500. At step 910 the demographic correlation 556 is computed and at step 920 the product preference correlation 558 is computed. An illustrative example of an algorithm for correlation is presented in FIG. 6b. The system returns demographic correlation 556 and product preference correlation 558 to the advertisement records 540 before exiting the procedure at end step 950.

FIG. 9 illustrates two pricing schemes, one for content/opportunity provider 160 based pricing 970, which shows increasing cost as a function of correlation. In this pricing scheme, the higher the correlation, the more the content/opportunity provider 160 charges to air the advertisement.

FIG. 9 also illustrates consumer based pricing 960, which allows a consumer to charge less to receive advertisements which are more highly correlated with their demographics and interests.

As an example of the industrial applicability of the invention, a consumer 100 can purchase items in a grocery store which also acts as a profiler 140 using a consumer profiling system 500. The purchase record is used by the

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profiler to update the probabilistic representation of customer 100, both in terms of their demographics as well as their product preferences. For each item purchased by consumer 100, product characterization information in the form of a product demographics vector and a product purchase vector is used to update the demographic characterization vector and the product preference vector for consumer 100.

A content/opportunity provider 160 may subsequently determine that there is an opportunity to present an advertisement to consumer 100. Content/opportunity provider 160 can announce this opportunity to advertiser 144 by transmitting the details regarding the opportunity and the consumer ID 512. Advertiser 144 can then query profiler 140 by transmitting consumer ID 512 along with advertisement specific information including the correlation request 546 and ad demographics vector 548. The consumer profiling system 500 performs a correlation and determines the extent to which the ad target market is correlated with the estimated demographics and product preferences of consumer 100. Based on this determination advertiser 144 can decide whether to purchase the opportunity or not.

Although this invention has been illustrated by reference to specific embodiments, it will be apparent to those skilled in the art that various changes and modifications may be made which clearly fall within the scope of the invention. The invention is intended to be protected broadly within the spirit and scope of the appended claims.

What is claimed is:

1. A computer implemented method for selecting a targeted advertisement to be presented to a consumer by determining the similarity between a profile of the consumer which is generated from detailed purchase records of the consumer and a profile for each of a plurality of advertisements, wherein the profile for each advertisement identifies discretionary characteristics of an intended target market of the advertisement, the method comprising:

receiving the advertisement profile for each of the plurality of advertisements;

retrieving the consumer profile, wherein the detailed purchase records used to generate the consumer profile include multiple point-of-sale transactions;

calculating a correlation factor between each advertisement profile and the consumer profile as a scalar product of the consumer profile and the advertisement profile; and

selecting the targeted advertisement to present to the consumer responsive to said calculating a correlation factor.

2. The method described in claim 1, wherein each advertisement profile includes a demographic characterization of the intended target market; the consumer profile includes a demographic characterization of the consumer; and

said calculating a correlation factor includes calculating the correlation factor between the demographic characterization of the intended target market and the demographic characterization of the consumer.

3. The method described in claim 1, wherein each advertisement profile includes a product preference characterization of the intended target market; the consumer profile includes a product preference characterization of the consumer; and

said calculating a correlation factor includes calculating the correlation factor between the product preference characterization of the intended target market and the product preference characterization of the consumer.

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4. The method of claim 1, further comprising determining a price to present the targeted advertisement to the consumer, wherein the price is a function of the correlation factor.

5. The method of claim 4, wherein the price is an increasing monotonic function of the correlation factor.

6. The method of claim 4, wherein the price is a decreasing monotonic function of the correlation factor.

7. The method of claim 1, wherein the discretionary characteristics include an indicator associated with a particular product, and further comprising determining if the detailed purchase records support the indicator associated with the product.

8. The method of claim 7, wherein the associated indicator includes previously purchased, never purchased, or only purchases.

9. The method of claim 8, wherein said correlating is only performed if the detailed purchase records support the associated indicator.

10. The method of claim 1, wherein the detailed purchase records are accumulated in at least one external database.

11. The method of claim 1, wherein the multiple point-of-sale transactions included in the detailed purchase records are transacted at a plurality of locations.

12. The method of claim 1, further comprising presenting the targeted advertisement to the consumer via a television.

13. The method of claim 12, wherein the targeted advertisement is transmitted to the television via a telecommunications access system.

14. The method of claim 13, wherein the television access system includes cable television systems, switched digital video systems, and microwave telecommunications systems.

15. The method of claim 1, further comprising presenting the targeted advertisement to the consumer via mail.

16. The method of claim 1, wherein the consumer profile and each advertisement profile are in the form of vectors.

17. A computer implemented method for selecting a targeted advertisement for a consumer by comparing a profile of the consumer which is generated from multiple transactions of the consumer to a profile of each of a plurality of advertisements, wherein each advertisement profile identifies discretionary characteristics of an intended target market of the advertisement, the method comprising:

receiving the advertisement profile for the advertisement;
retrieving the consumer profile, wherein the multiple transactions used to generate the consumer profile include purchases of the consumer from multiple points-of-sale;

calculating a correlation factor between the advertisement profile and the consumer profile as a scalar product of the consumer profile and the advertisement profile; and
selecting the targeted advertisement to present to the consumer responsive to said calculating a correlation factor.

18. The method of claim 17, wherein the multiple transactions further include television viewing transactions.

19. The method of claim 17, wherein said retrieving the consumer profile includes

retrieving a detailed transaction record, wherein the detailed transaction record includes an inventory of each of the multiple transactions which occurred over a predetermined time interval; and
generating the consumer profile from the detailed transaction record.

20. The method of claim 19, wherein said retrieving the consumer profile further includes retrieving a set of heuristic

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rules associated with transactions within the detailed transaction records, the set of heuristic rules defining a probabilistic measure of demographic characteristics of a person performing the transactions, and said generating the consumer profile includes generating the consumer profile based on the detailed transaction record and the set of heuristic rules.

21. The method of claim 19, wherein said retrieving the detailed transaction record includes

storing each of the multiple transactions of the consumer; and

generating the detailed transaction record based on the stored transactions.

22. A computer system for selecting a targeted advertisement to be presented to a consumer by determining the similarity between a profile of the consumer which is generated from detailed purchase records of the consumer and a profile of each of a plurality of advertisements, each profile identifying discretionary characteristics of an intended target market of the advertisement, the system comprising:

a storage medium;

means for receiving the advertisement profile for the advertisement;

means for retrieving the consumer profile, wherein the detailed purchase records used to generate the consumer profile include multiple point-of-sale transactions;

means for calculating a correlation factor between the advertisement profile and the consumer profile as a scalar product of the consumer profile and the advertisement profile; and

means for selecting the targeted advertisement to present to the consumer responsive to said calculating a correlation factor.

23. The system of claim 22, further comprising means for accumulating detailed purchase records from a plurality of point of sale transactions.

24. The system of claim 22, further comprising means for accumulating detailed purchase records from a plurality of locations.

25. The system of claim 22, further comprising

means for retrieving a pricing function; and

means for determining a price for displaying the advertisement to the consumer, wherein the price is determined from the correlation factor and the pricing function.

26. The system of claim 22, further comprising means for transmitting the targeted advertisement to the consumer.

27. The system of claim 26, wherein the means for transmitting is a television access system.

28. The system of claim 26, wherein the means for transmitting is mail delivery.

29. The system of claim 22, wherein said means for retrieving a consumer profile includes:

means for retrieving the detailed purchase records of the consumer;

means for retrieving a set of heuristic rules associated with products included in the detailed purchase records, wherein the set of heuristic rules define a probabilistic measure of demographic characteristics of a purchaser of corresponding products; and

means for generating the consumer profile from the detailed purchase records and the set of heuristic rules.

30. A computer program embodied on a computer-readable medium for selecting a targeted advertisement for

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a consumer by comparing a profile of the consumer which is generated from multiple transactions of the consumer to a profile of each of a plurality of advertisements, wherein each advertisement profile identifies specific characteristics of an intended target market of the advertisement, the computer program comprising:

a source code segment for receiving the advertisement profile for the advertisement;

a source code segment for retrieving the consumer profile, wherein the multiple transactions used to generate the consumer profile include purchases of the consumer from multiple points-of-sale; and

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a source code segment for calculating a correlation factor between the advertisement profile and the consumer profile as a scalar product of the consumer profile and the advertisement profile; and

a source code segment for selecting the targeted advertisement to present to the consumer responsive to said calculating a correlation factor.

31. The computer program described in claim **30**, further comprising a source code segment for transmitting said correlation factor to advertisers.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,216,129 B1
DATED : April 10, 2001
INVENTOR(S) : Charles A. Eldering

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 5,

Lines 35, 37 and 60, delete "provider" and replace with -- provider 160 --;

Column 6,

Line 1, delete "advertisers" and replace with -- advertisers 144 --;

Line 13, delete "content" and replace with -- content/opportunity --;

Line 13, delete "provider" and replace with -- provider 160 --;

Line 20, delete "162" and replace with -- 164 --;

Line 37, delete "purchase" and replace with -- purchase 110 --;

Column 10,

Line 27, delete "purchase" and replace with -- purchase 110 --;

Column 14,

Line 1, delete "profiler" and replace with -- profiler 140 --;

Column 16,

Line 23, delete "the a" and replace with -- the --.

Signed and Sealed this

Twenty-seventh Day of January, 2004

A handwritten signature in black ink, appearing to read "Jon W. Dudas". The signature is stylized with a large, looped initial "J" and a cursive "Dudas".

JON W. DUDAS

Acting Director of the United States Patent and Trademark Office